

CLAIMS

1. A positive type photosensitive resin composition, comprising at least:

(1) an acrylic resin having a carboxylic anhydride structure in a molecule; and

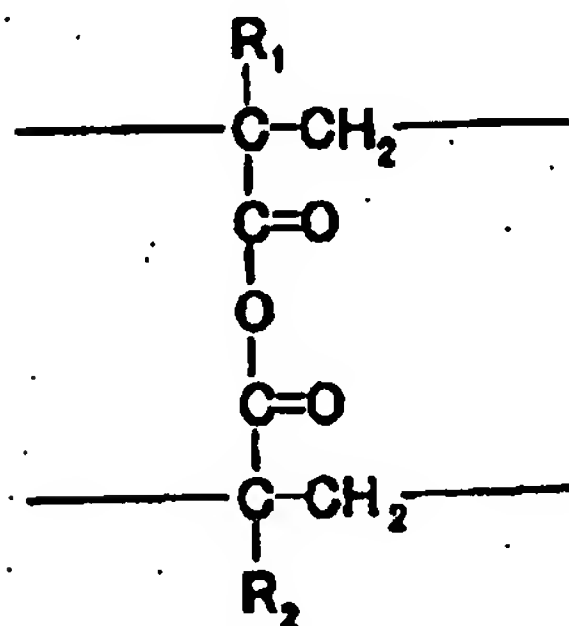
(2) a compound that generates an acid when irradiated with light.

2. A photosensitive resin composition according to claim 1, wherein the acrylic resin undergoes intramolecular cross-linking through the carboxylic anhydride structure.

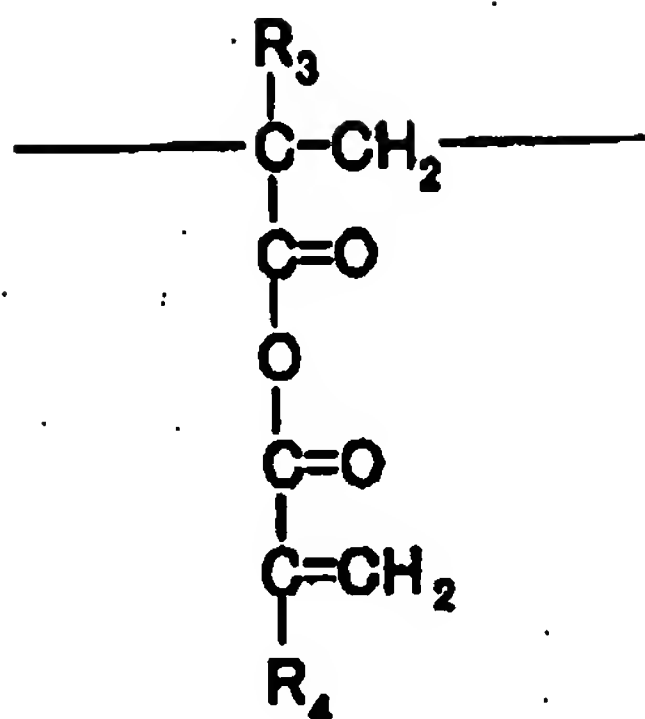
3. A photosensitive resin composition according to claim 1, wherein the acrylic resin has the carboxylic anhydride structure at a side chain thereof.

4. A photosensitive resin composition according to claim 1, wherein the acrylic resin has at least one kind of structural units represented by the following general formulae 1 and 2.

Formula 1



Formula 2



(In the general formulae 1 and 2, R_1 to R_4 each independently represent a hydrogen atom or an alkyl group having 1 to 3 carbon atoms.)

5. A photosensitive resin composition according to claim 1, wherein the acrylic resin comprises a polymer containing at least methacrylic anhydride as a monomer component.

10 6. A photosensitive resin composition according to claim 1, wherein the acrylic resin comprises a polymer containing at least methacrylic anhydride and methyl methacrylate as monomer components.

15 7. A photosensitive resin composition according to claim 1, wherein the compound that generates an acid when irradiated with light comprises one of an aromatic sulfonium salt, an aromatic iodonium salt, and a triazine compound.

20 8. A method of forming a pattern having a level difference on a substrate by means of a positive type

photosensitive resin, comprising:

(1) a step of forming a layer of the photosensitive resin composition according to claim 1 on the substrate;

5 (2) a first photolithographic step of removing a part except a part serving as a first pattern of the layer of the photosensitive resin composition up to a predetermined depth in a thickness direction to form the first pattern composed of a part protruding
10 from the predetermined depth; and

(3) a second photolithographic step of removing a part on the substrate except a part serving as a second pattern of the layer of the photosensitive resin composition on which the first pattern is
15 formed while maintaining a shape of the first pattern to prepare a pattern having a level difference shape in which the first pattern is placed on the second pattern, characterized in that:

the first lithography step includes process
20 steps of exposure, heating after exposure, and development;

a reaction for making the layer of the photosensitive resin composition positive in the first photolithographic step is derived from at least
25 a hydrolytic reaction of a carboxylic anhydride in the acrylic resin;

the second photolithographic step includes

process steps of exposure and development; and
a reaction for making the layer of the
photosensitive resin composition positive in the
second photolithographic step is derived from at
least a main chain decomposition reaction of the
5 acrylic resin.

9. A method of forming a level difference
pattern according to claim 8, wherein an exposure
wavelength in the first photolithographic step is
10 longer than an exposure wavelength in the second
photolithographic step.

10. A method of forming a level difference
pattern according to claim 8, wherein a developer
containing: (1) a glycol ether which can be mixed
15 with water at an arbitrary ratio and has 6 or more
carbon atoms; (2) a nitrogen-containing basic organic
solvent; and (3) water is used as a developer for the
positive type photosensitive resin.

11. A method of forming a level difference
20 pattern according to claim 10, wherein the glycol
ether comprises at least one kind of ethylene glycol
monobutyl ether and diethylene glycol monobutyl ether.

12. A method of forming a level difference
pattern according to claim 10, wherein the nitrogen-
25 containing basic organic solvent comprises at least
one kind of ethanolamine and morpholine.

13. A method of producing an ink jet head

including: a discharge port for discharging ink; an ink flow path which is in communication with the discharge port and has therein a pressure generating element for discharging the ink; a substrate on which the pressure generating element is formed; and an ink flow path forming member which is joined to the substrate to form the ink flow path, the method comprising the steps of:

(1) arranging a layer of a positive type photosensitive resin composition on the substrate on which the pressure generating element is formed;

(2) irradiating a predetermined site of the layer of the photosensitive resin composition with ionization radiation;

(3) removing the site irradiated with the ionization radiation through development to form a desired ink flow path pattern;

(4) forming, on the ink flow path pattern, a coating resin layer for forming an ink flow path wall;

(5) forming, in the coating resin layer placed on the pressure generating element formed on the substrate, an ink discharge port; and

(6) dissolving and removing the ink flow path pattern, characterized in that the positive type photosensitive resin composition comprises the photosensitive resin composition according to claim 1.

14. A method of producing an ink jet head including: a discharge port for discharging ink; an ink flow path which is in communication with the discharge port and has therein a pressure generating element for discharging the ink; a substrate on which the pressure generating element is formed; and an ink flow path forming member which is joined to the substrate to form the ink flow path, the method comprising the steps of:

10 (1) arranging a layer of a first positive type photosensitive resin composition on the substrate on which the pressure generating element is formed;

 (2) forming a layer of a second positive type photosensitive resin composition on the layer of the first positive type photosensitive resin composition;

15 (3) irradiating a predetermined site of the layer of the second positive type photosensitive resin composition with ionization radiation having a wavelength region in which the layer of the second positive type photosensitive resin composition can react;

20 (4) removing the site of the layer of the second positive type photosensitive resin composition irradiated with the ionization radiation through development to form a second ink flow path pattern;

 (5) irradiating a predetermined site of the layer of the first positive type photosensitive resin

composition with ionization radiation having a wavelength region in which the layer of the first positive type photosensitive resin composition can react;

5 (6) removing the site of the layer of the first positive type photosensitive resin composition irradiated with the ionization radiation through development to form a first ink flow path pattern;

 (7) forming, on the first and second ink flow
10 path patterns, a coating resin layer for forming an ink flow path wall;

 (8) forming, in the coating resin layer placed on the pressure generating element formed on the substrate, an ink discharge port; and

15 (9) dissolving and removing the first and second ink flow path patterns, characterized in that the second positive type photosensitive resin composition comprises the photosensitive resin composition according to claim 1.

20 15. A method of producing an ink jet head including: a discharge port for discharging ink; an ink flow path which is in communication with the discharge port and has therein a pressure generating element for discharging the ink; a substrate on which
25 the pressure generating element is formed; and an ink flow path forming member which is joined to the substrate to form the ink flow path, the method

comprising:

(1) a step of forming a layer of the photosensitive resin composition according to claim 1 on the substrate on which the pressure generating
5 element is formed;

(2) a first photolithographic step of removing a part except a part serving as a first ink flow path pattern of the layer of the photosensitive resin composition up to a predetermined depth in a
10 thickness direction to form the first ink flow path pattern composed of a part protruding from the predetermined depth;

(3) a second photolithographic step of removing a part on the substrate except a part serving as a
15 second ink flow path pattern of the layer of the photosensitive resin composition on which the first ink flow path pattern is formed while maintaining a shape of the first ink flow path pattern to prepare a level difference structure in which the first ink
20 flow path pattern is placed on the second ink flow path pattern;

(4) a step of forming, on the level difference structure, a coating resin layer for forming an ink flow path wall;

25 (5) a step of forming, in the coating resin layer placed on the pressure generating element formed on the substrate, an ink discharge port; and

(6) a step of dissolving and removing the level difference structure, characterized in that:

the first lithography step includes process steps of exposure, heating after exposure, and
5 development;

a reaction for making the layer of the photosensitive resin composition positive in the first photolithographic step is derived from at least a hydrolytic reaction of a carboxylic anhydride in
10 the acrylic resin;

the second photolithographic step includes process steps of exposure and development; and

a reaction for making the layer of the photosensitive resin composition positive in the
15 second photolithographic step is derived from at least a main chain decomposition reaction of the acrylic resin.

16. A method of producing an ink jet head according to claim 15, wherein an exposure wavelength
20 in the first photolithographic step is longer than an exposure wavelength in the second photolithographic step.

17. A method of producing an ink jet head according to claim 15, wherein a developer
25 containing: (1) a glycol ether which can be mixed with water at an arbitrary ratio and has 6 or more carbon atoms; (2) a nitrogen-containing basic organic

solvent; and (3) water is used as a developer for the positive type photosensitive resin.

18. A method of producing an ink jet head according to claim 17, wherein the glycol ether
5 comprises at least one kind of ethylene glycol monobutyl ether and diethylene glycol monobutyl ether.

19. A method of producing an ink jet head according to claim 17, wherein the nitrogen-containing basic organic solvent comprises at least
10 one kind of ethanolamine and morpholine.

20. An ink jet head produced according to the method of producing an ink jet head according to claim 13.